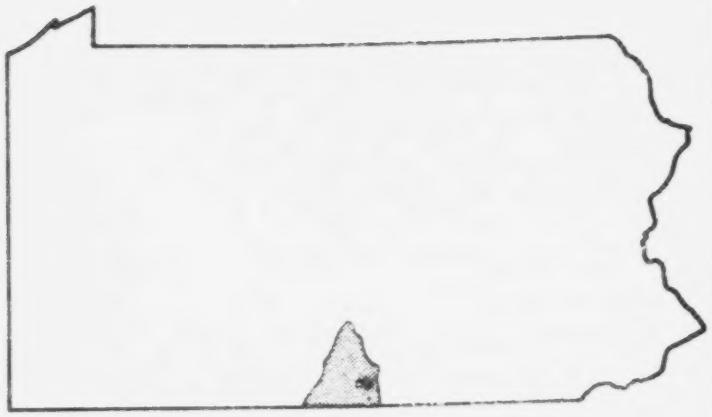
FLOOD INSURANCE STUDY

TOWNSHIP OF QUINCY, PENNSYLVANIA
FRANKLIN COUNTY



JULY 16, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER 421655

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Flood Insurance Study Effective Date: July 16, 1990

Flood Insurance Study Revised:

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
	1.3 Coordination	1
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	2
	2.3 Principal Flood Problems	2
	2.4 Flood Protection Measures	2
3.0	ENGINEERING METHODS	2
	3.1 Hydrologic Analyses	4
	3.2 Hydraulic Analyses	5
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	6
	4.1 Floodplain Boundaries	6
	4.2 Floodways	6
5.0	INSURANCE APPLICATIONS	8
6.0	FLOOD INSURANCE RATE MAP	9
7.0	OTHER STUDIES	9
8.0	LOCATION OF DATA	10
9.0	BIBLIOGRAPHY AND REFERENCES	10

TABLE OF CONTENTS - continued

Page

FIGURES

Figure 1 - Vicinity Map 3

Figure 2 - Floodway Schematic 7

TABLES

Table 1 - Summary of Discharges 4-5

EXHIBITS

Exhibit 1 - Flood Profiles
West Branch Antietam Creek Panels 01P-05P
Unnamed Tributary to West Branch Antietam Creek Panel 06P-07P

Exhibit 2 - Flood Insurance Rate Map Index and Street Index
Flood Insurance Rate Map

Exhibit 3 - Elevation Reference Marks

FLOOD INSURANCE STUDY
TOWNSHIP OF QUINCY, FRANKLIN COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of Quincy, Franklin County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the U. S. Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 21. This work was completed in November 1987.

1.3 Coordination

On April 2, 1985, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives from FEMA, the township, and the USGS (the study contractor) to determine the streams to be studied by detailed methods.

On July 5, 1989, a final CCO meeting was held with representatives from FEMA, the township, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of Quincy, Franklin County, Pennsylvania. The Borough of Mont Alto is not included in this study. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: West Branch Antietam Creek, from the downstream corporate limits to a point approximately 0.79 mile upstream of L. R. 28009 (Anthony Highway); and an Unnamed Tributary to West Branch Antietam Creek, from the downstream corporate limits to a point approximately 800 feet upstream of L. R. 28032 (Clay Hill Road). The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through November 1992.

The following streams were studied by approximate methods: Nunnery Creek, East Branch Antietam Creek, Biesecker Run, and the remaining portions of West Branch Antietam Creek. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Township of Quincy.

2.2 Community Description

The Township of Quincy is located in the southern portion of Franklin County in southern Pennsylvania, approximately 60 miles south of Harrisburg. It is bordered by the Township of Guilford to the north, the Township of Hamiltonban to the east, the Township of Washington to the south, and the Township of Antrim to the west. The Township of Quincy completely surrounds the Borough of Mont Alto.

2.3 Principal Flood Problems

Major floods cause localized inundation of structures along West Branch Antietam Creek and along an unnamed tributary to West Branch Antietam Creek.

2.4 Flood Protection Measures

No flood protection measures have been taken in the community.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which

HUNTINGDON
FULTON
FRANKLIN
CUMBERLAND
ADAMS
Chambersburg
QUINCY
Waynesboro
Gettysburg
Carlisle
Shippensburg
Mercersburg
Greencastle
Fayetteville
Scotland
Edenville
Metal
Fannettsburg
Mont Alto
Tomstown
Fairfield
Littlestown
Kingsdale
Blue Ridge Summit
Mountain
Tuscarora
Dickeys Mtn
Harbor Mtn
Cove Mtn
Sideling Hill
Blue Mountain
Path Valley
Tuscarora Mountain
Shade Gap
Three Springs
Orbisonia
Mount Union
Cashtown
Upton
Shimpstown
Amaranth
Buck Valley
Warfordsburg
Needmore
Harrisonville
Saluvia
Breezewood
Everett
Hustontown
Knobsville
Metal
Markes
Williamson
Kauffman
Lemasters
Websters Mill
Shady Grove
Zullinger
Rouzerville
Iron Springs
Greenmount
Two Taverns
Bonneauville
New Oxford
Abbottstown
Hunterstown
Mummasburg
Arendtsville
Biglerville
Table Rock
Aspers
Gardners
Wenksville
Bendersville
Floradale
Center Mills
Heidlersburg
Hampton
Newchester
Mount Holly Springs
Walnut Bottom
Boiling Springs
Mechanicsburg
Camp Hill
Wormleysburg
Lemoyne
Shiremanstown
Mechanicsburg
Newville
Mt Rock
Oakville
Shughtstown
Middle Spring
Mowersville
Roxbury
Willow Hill
Orrstown
Upper Strasburg
Pleasant Hall
Nyesville
Green Village
Mt Rock
Richmond Furnace
St Thomas
Stouffers town
Mont Union
New Franklin
Marion
Altenwald
Five Forks
Zullinger
Shady Grove
Waynesboro
Rouzerville
Blue Ridge Summit
Fountain Dale
Kingsdale
Littlestown
Mt Hope
Fairfield
Iron Springs
Greenmount
Two Taverns
Bonneauville
Mt Pleasant

is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The flood frequency-discharge values for West Branch Antietam Creek and the Unnamed Tributary to West Branch Antietam Creek were determined using regional regression equations developed in USGS Water-Resources Investigations 82-21 (Reference 1).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
WEST BRANCH ANTIETAM CREEK		
At downstream corporate limits	17.7	1,870
At T-383 (Orphanage Road)	12.6	1,490
At T-391 (Hess Benedict Road)	11.4	1,380
At L. R. 28023 (Manheim Road)	9.6	1,240
At T-397 (Mt. Zion Road)	8.2	1,130
At T-399 (Stamey Mill Road)	7.0	1,050
At downstream corporate limits of Borough of Mont Alto	6.8	1,030
At State Route 997 (Ash Avenue)	5.7	970
At L. R. 28009 (Anthony Highway)	4.2	860
At T-600 (Orchard Road)	3.7	820

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
UNNAMED TRIBUTARY TO WEST BRANCH ANTIETAM CREEK		
At downstream corporate limits	14.7	620
At L. R. 28029 (Wharf Road)	13.2	570
At L. R. 28081 (Five Forks Road)	11.2	560

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections were fields surveyed and located at close intervals above and below bridges and culverts in order to compute the significant backwater effects of these structures. All bridges, dams and culverts in the community were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

Water-surface elevations for floods of the selected recurrence interval on West Branch Antietam Creek, from the downstream corporate limits to State Route 997 (Ash Avenue), were computed by modeling channel and bridge hydraulics with the USGS WSPRO step-backwater computer program (References 2 and 3). The starting water-surface elevation was determined from 100-year depths in open-channel portions of West Branch Antietam Creek in the Township of Washington (Reference 4). Water-surface elevations for the remaining portion of West Branch Antietam Creek, and for the Unnamed Tributary to West Branch Antietam Creek, were determined by adding 100-year flood depths to streambed elevations. Normal depths of flooding for the 100-year recurrence interval were estimated from the regional relationship between drainage area and flood depth prepared by the USGS (Reference 5). This relationship was developed by means of regional regression analyses of basin areas and 100-year within-channel depths observed at stream gages. Depths were adjusted on the basis of hydraulic calculations to account for increased depth due to backwater from hydraulic structures, such as bridges and culverts (References 2, 3 and 6). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence interval.

Channel roughness factors (Manning's "n") used in the hydraulic computations were assigned on the basis of engineering judgment and

field inspection of the floodplain areas. For the streams studied by detailed methods, the channel "n" values ranged from 0.033 to 0.036, and the overbank "n" values ranged from 0.040 to 0.070.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the stream studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 7).

For the streams studied by approximate methods, the 100-year floodplain boundaries were delineated using USGS topographic maps and the Flood Hazard Boundary Map for the Township of Quincy (References 7 and 8).

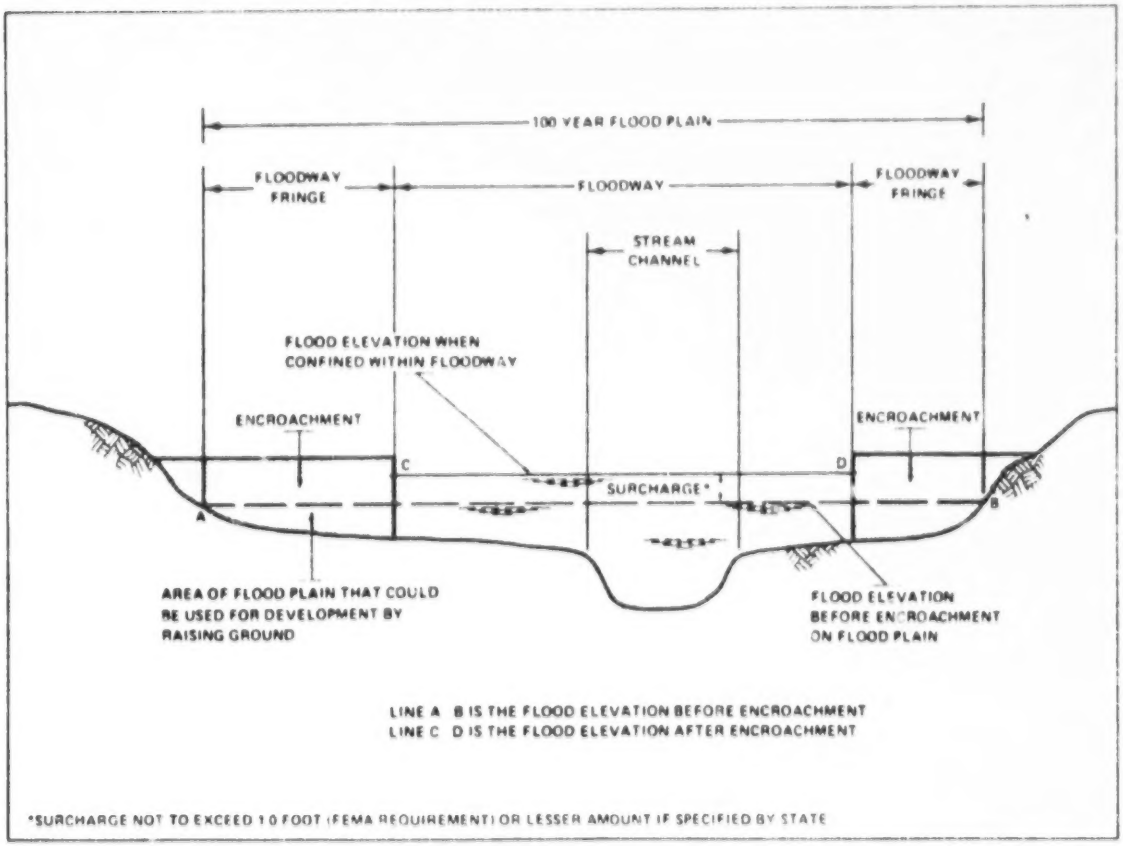
The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself.

One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC Figure 2

No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study has been prepared for the Township of Antrim (Reference 9). The results of this study are in complete agreement with the results of that study. A Flood Insurance Study has been prepared for the Township of Washington (Reference 4). Because the analyses in this study are more up-to-date, the 100-year water-surface elevation on West Branch Antietam Creek at the downstream corporate limits of the Township of Quincy does not agree with the elevation reported in the Washington study. The Flood Insurance Study for the Township of Washington will be revised in the future so that its results will agree with the results of this study.

Flood Insurance Studies have been prepared for the Townships of Guilford and Hamiltonban, and for the Borough of Mont Alto (References 10, 11 and 12). The results of this study are in complete agreement with the results of those studies.

Because it is based on more detailed analyses, this study supersedes the Flood Hazard Boundary Map for the Township of Quincy (Reference 8).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of the Interior, Geological Survey, Water-Resources Investigations 82-21, Evaluation of the Streamflow-Data Program in Pennsylvania by H. N. Flippo, Jr., Harrisburg, Pennsylvania, 1982.

2. Federal Highway Administration, Report FHWA/RD-86/108, Bridge Waterways Analysis Model/Research Report by J. O. Shearman, W. H. Kirby, V. R. Schneider, and H. N. Flippo, Jr., Washington, D. C., 1986.

3. National Technical Information Service, Bridge Waterways Analysis Model/User's Instructions by J. O. Shearman, W. H. Kirby, and V. R. Schneider, Springfield, Virginia, 1985.

4. Federal Emergency Management Agency, Flood Insurance Study, Township of Washington, Franklin County, Pennsylvania, Washington, D. C., June 3, 1986.

5. U. S. Department of the Interior, Geological Survey, Water-Resources Investigations 86-4195, Technique for Estimating Depths of 100-Year Floods in Pennsylvania by H. N. Flippo, Jr., Harrisburg, Pennsylvania, 1986.

6. U. S. Department of the Interior, Geological Survey, Techniques of Water-Resources Investigations, Measurement of Peak Discharge at Width Contractions by Indirect Methods by H. F. Matthai, Washington, D. C., 1967.

7. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Waynesboro, Pennsylvania, 1944, Photorevised 1973.

8. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Quincy, Franklin County, Pennsylvania, June 20, 1980.

9. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Township of Antrim, Franklin County, Pennsylvania, Washington, D. C., October 24, 1980.

10. Federal Emergency Management Agency, Flood Insurance Study, Township of Guilford, Franklin County, Pennsylvania, Washington, D. C., June 18, 1990.

11. Federal Emergency Management Agency, Flood Insurance Study, Township of Hamiltonban, Adams County, Pennsylvania, Washington, D. C., July 4, 1988.

12. Federal Emergency Management Agency, Flood Insurance Study, Borough of Mont Alto, Franklin County, Pennsylvania, Washington, D. C., July 16, 1990.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	*	633.13	PDH disk on southeast wing wall of State Route 316 (Wayne Highway) bridge over West Branch Antietam Creek, approximately 3,000 feet downstream of downstream corporate limits.
RM 2	15	696.32	Chiseled square on top of northeast upstream abutment of T-383 (Orphanage Road) bridge over West Branch Antietam Creek.
RM 3	15	767.46	PDH disk, stamped P 157 1942, set in west wing wall of 4-foot by 6-foot concrete box culvert, approximately 400 feet south of T-393 (Mt. Zion Road), and approximately 14 feet west of centerline of State Route 997 (Anthony Highway).
RM 4	15	802.73	Chiseled square cut on top of northeast wing wall of T-399 (Stamey Mill Road) bridge over West Branch Antietam Creek.
RM 5	15	847.56	Standard USGS disk, stamped 848 Harrisburg, set vertically in south wall of M. E. Church facing State Route 997 in Borough of Mont Alto, approximately 12 feet east of entrance door, and approximately 0.8 foot above sidewalk.
RM 6	15	979.23	Standard USGS disk, stamped G 157 1942, set in top of southwest headwall of 18-inch pipe culvert under State Route 233 at intersection of Oak Road, approximately 1 mile east of US Post Office in Borough of Mont Alto.
RM 7	15	664.01	Chiseled square on top of downstream end of southwest abutment of L. R. 28029 (Wharf Road) bridge over Unnamed Tributary to West Branch Antietam Creek
RM 8	15	691.17	Chiseled square on top of southwest wing wall of L. R. 28081 (Five Forks Road) bridge over Unnamed Tributary to West Branch Antietam Creek.

*Located outside corporate limits; not shown on map

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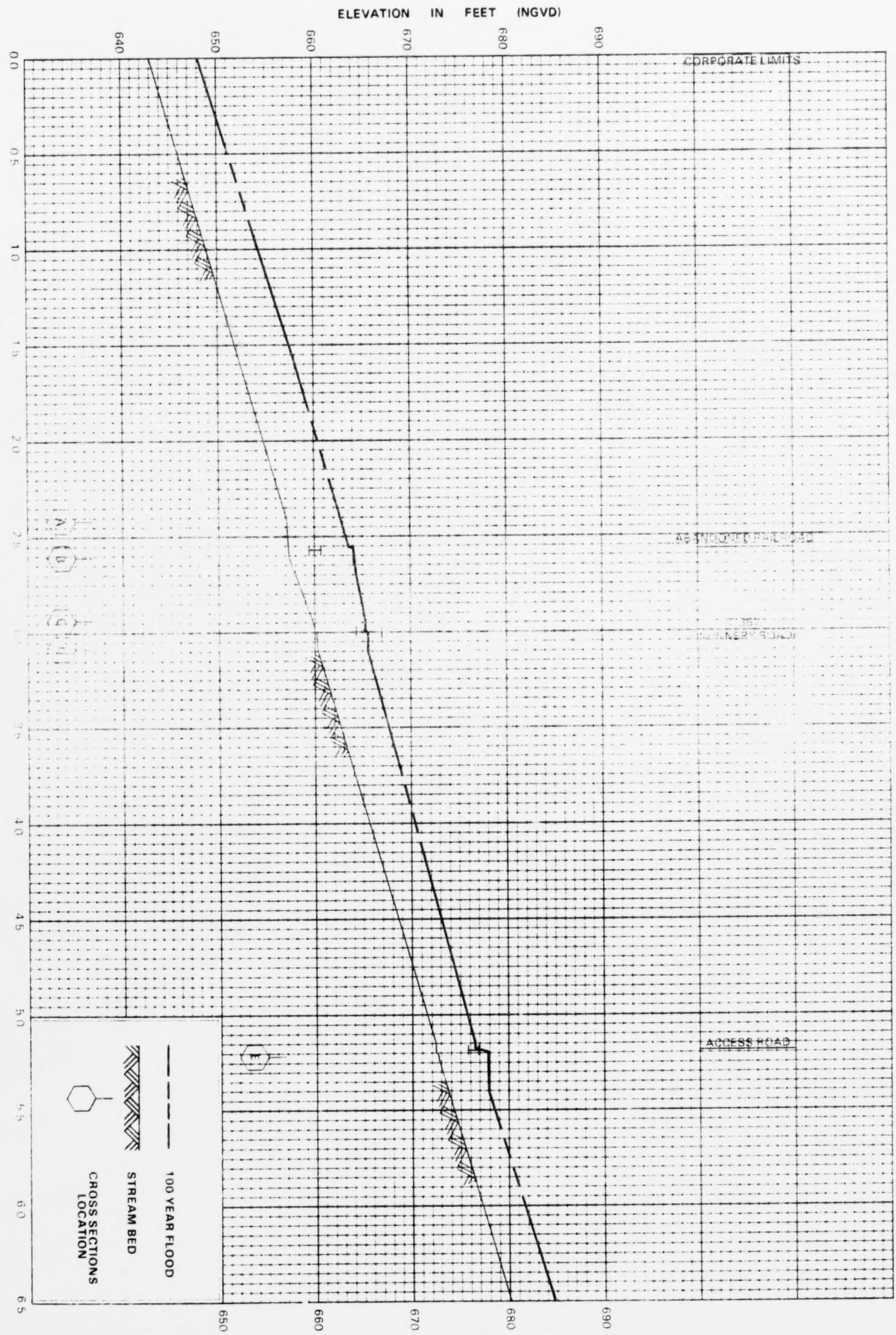


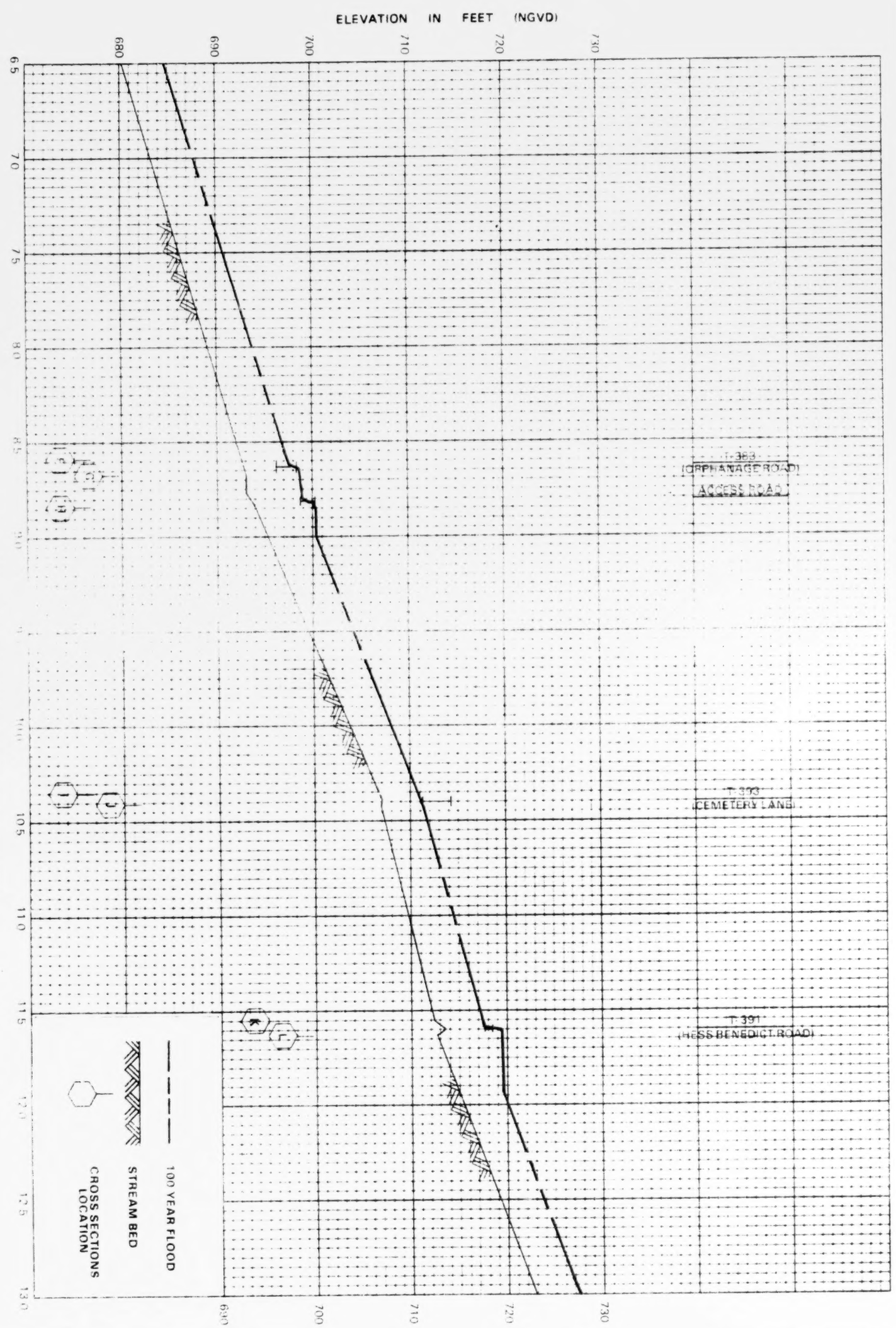
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF QUINCY, PA
(FRANKLIN CO.)

FLOOD PROFILES

WEST BRANCH ANTIETAM CREEK

01P



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FEDERAL EMERGENCY MANAGEMENT AGENCY

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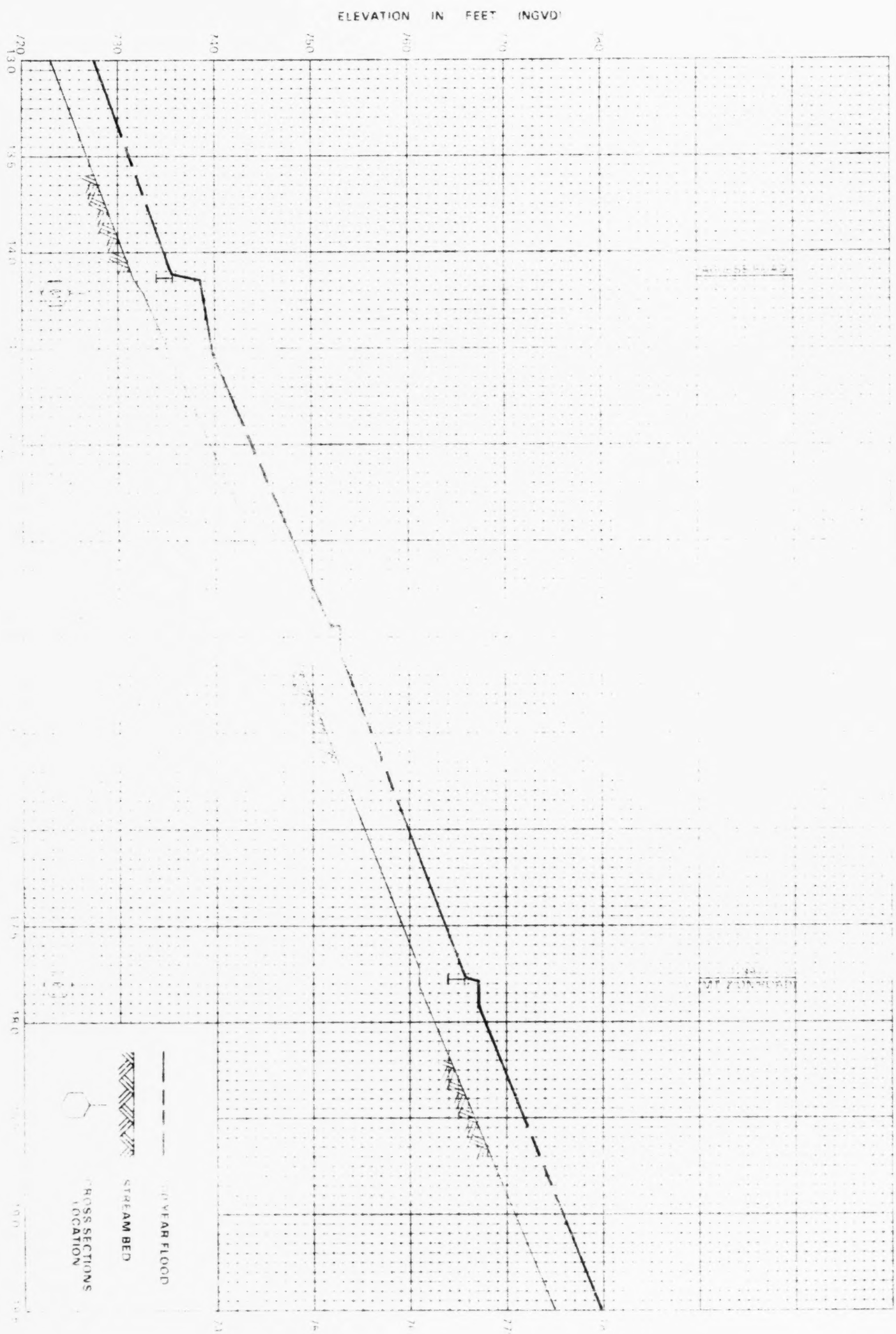
TOWNSHIP OF QUINCY, PA
(FRANKLIN CO.)

FLOOD PROFILES

WEST BRANCH ANTIETAM CREEK



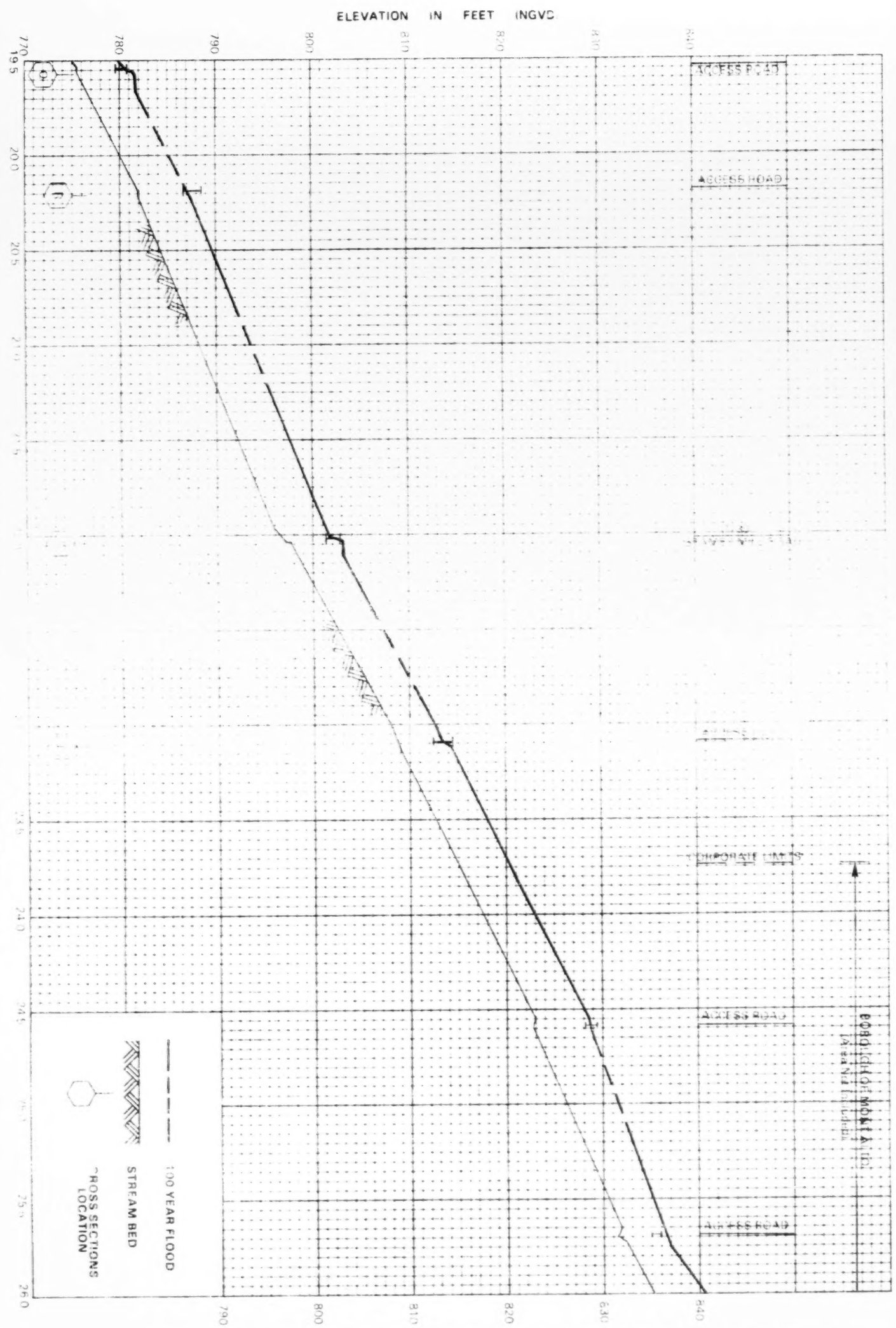
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF QUINCY, PA
(FRANKLIN CO.)

03P

FLOOD PROFILES

WEST BRANCH ANTIETAM CREEK



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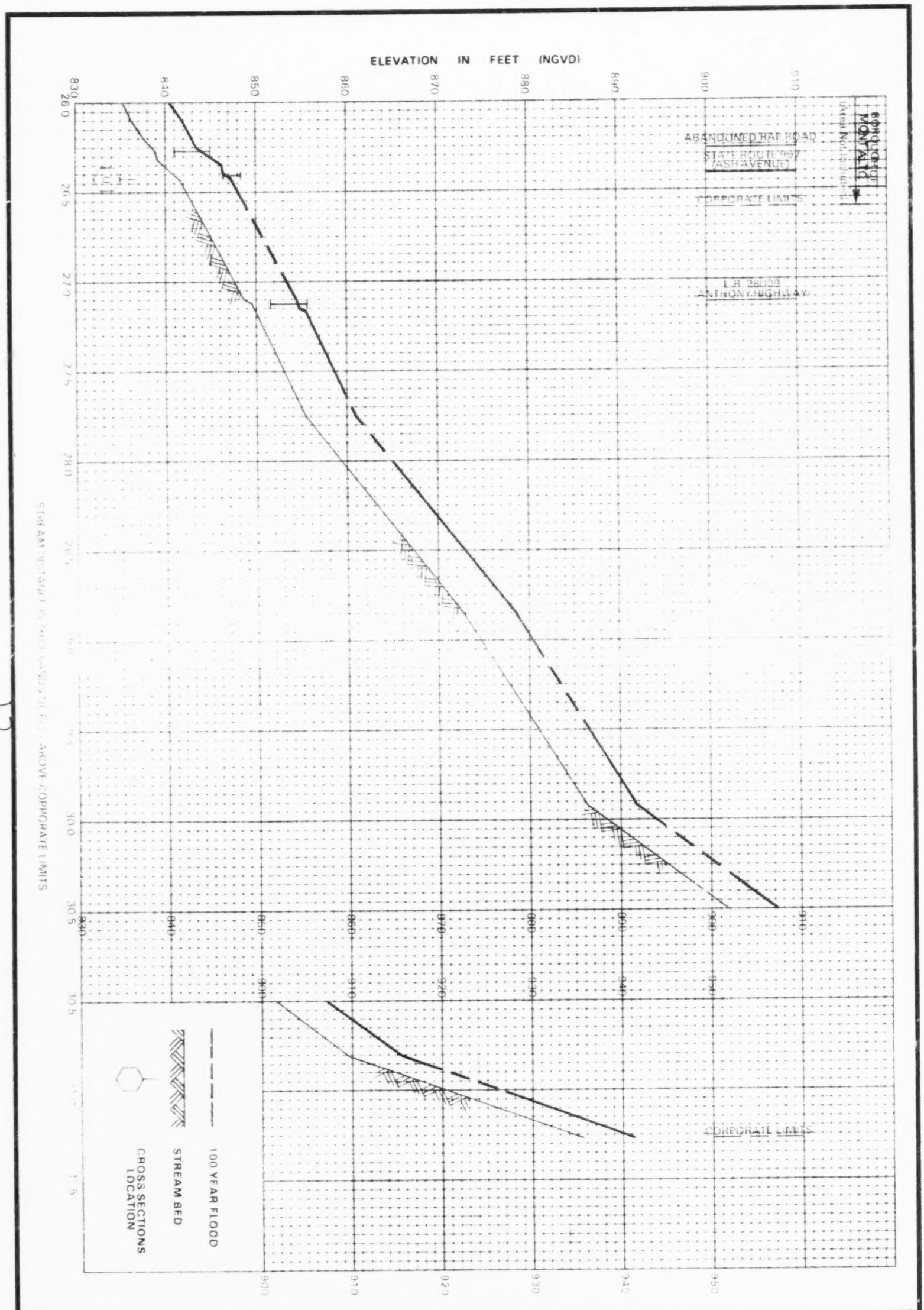
04P	FEDERAL EMERGENCY MANAGEMENT AGENCY TOWNSHIP OF QUINCY, PA (FRANKLIN CO.)	FLOOD PROFILES WEST BRANCH ANTIETAM CREEK



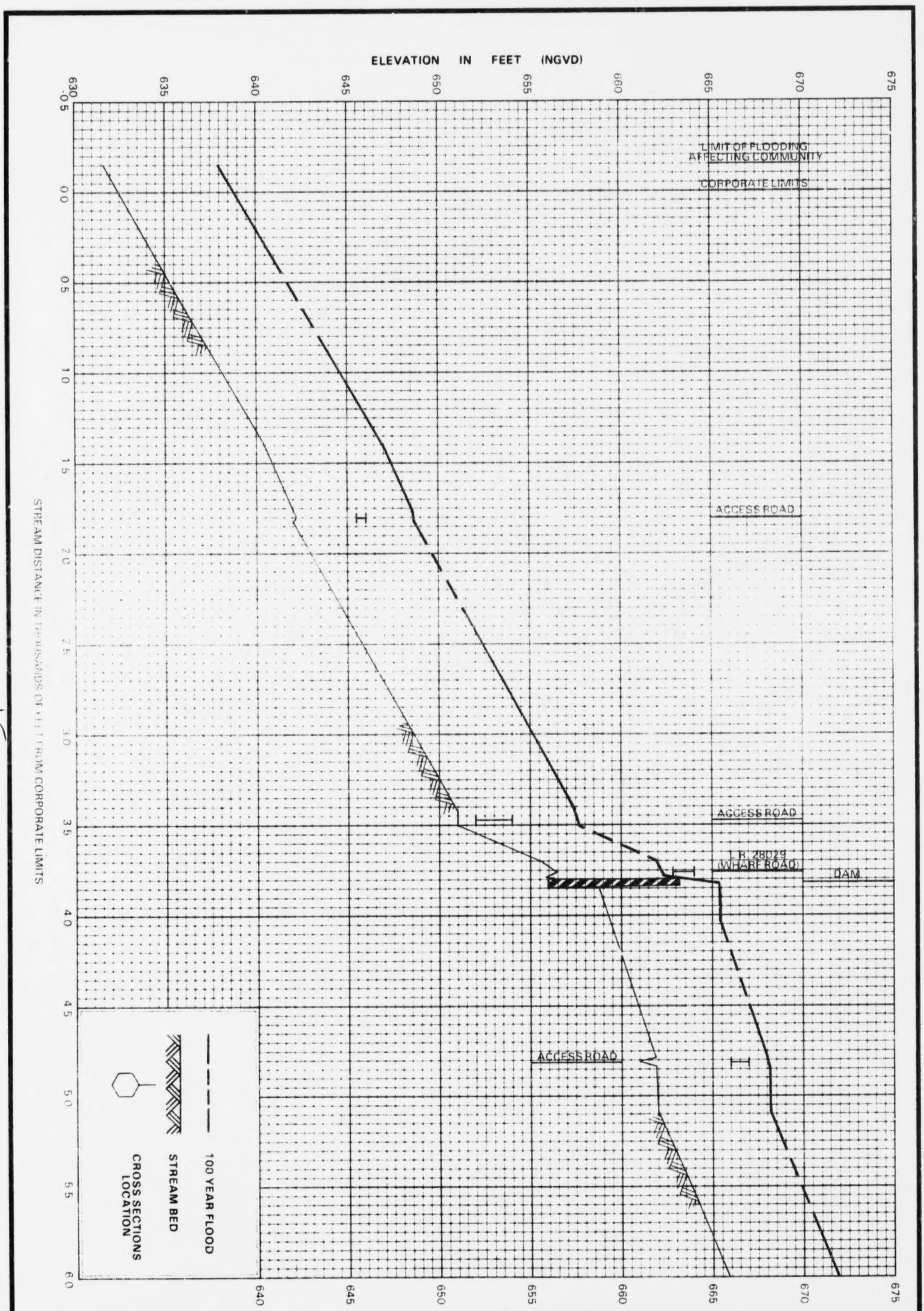
FEDERAL EMERGENCY MANAGEMENT AGENCY

05P

TOWNSHIP OF QUINCY, PA
(FRANKLIN CO.)

FLOOD PROFILES

WEST BRANCH ANTIETAM CREEK



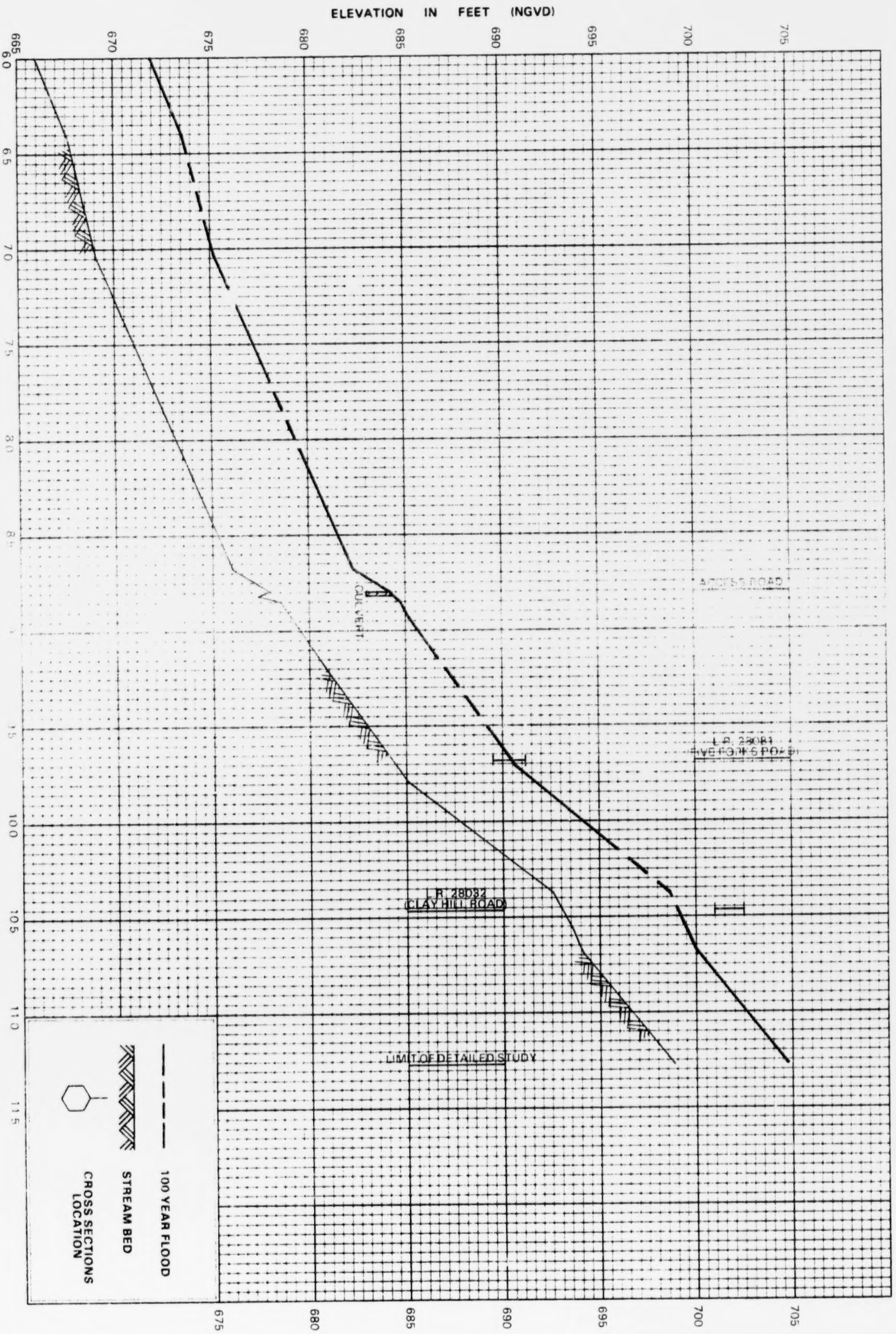
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF QUINCY, PA
(FRANKLIN CO.)

FLOOD PROFILES

UNNAMED TRIBUTARY TO WEST BRANCH ANTIETAM CREEK

06P



FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF QUINCY, PA
(FRANKLIN CO.)

FLOOD PROFILES

UNNAMED TRIBUTARY TO WEST BRANCH ANTIETAM CREEK

07P